CLAIMS

What is claimed is:

1. A gas treatment plant comprising an absorber in which acid gas is removed from a feed gas using a physical solvent to produce a rich solvent, and wherein the rich solvent is contacted with a recycle gas that is produced from the rich solvent.

2. The gas treatment plant of claim 1 wherein the feed gas comprises natural gas at a pressure of at least 2000 psig, and wherein the acid gas is at least one of hydrogen sulfide and carbon dioxide.

3. The gas treatment plant of claim 1 wherein the recycle gas is produced from flashed gases of a plurality of serially coupled flash vessels, and wherein the recycle gas is compressed to absorber pressure.

4. The gas treatment plant of claim 1 wherein the rich solvent is flashed in a flash vessel to produce an atmospheric flashed rich solvent that is fed into a vacuum stripper to produce lean solvent.

5. The gas treatment plant of claim 4 wherein the vacuum stripper separately receives as a stripping gas a sweet gas produced by the absorber and atmospheric flash gas from the flash vessel.

6. The gas treatment plant of claim 1 wherein the rich solvent is contacted with the recycle gas in the bottom portion of the absorber.

7. The gas treatment plant of claim 1 wherein the rich solvent is contacted with the recycle gas in a static mixer outside the absorber.

8. A gas treatment plant comprising a contact vessel in which a rich solvent from an absorber contacts a recycle gas, wherein the recycle gas is produced from the rich solvent, and wherein the absorber receives a feed gas from which an acid gas is removed using a physical solvent, thereby producing the rich solvent.

9. The gas treatment plant of claim 8 wherein the feed gas comprises natural gas at a pressure of at least 2000 psig, and wherein the acid gas is at least one of hydrogen sulfide and carbon dioxide.

10. The gas treatment plant of claim 8 wherein the contact vessel comprises a static mixer, and wherein the contact vessel is fluidly coupled to a flash vessel.

11. The gas treatment plant of claim 8 wherein the rich solvent is flashed downstream of the contact vessel in a plurality of sequentially coupled flash vessels, wherein each of the flash vessels produces a portion of the recycle gas.

12. The gas treatment plant of claim 11 wherein at least one of the flash vessels produces a flashed rich solvent that is fed into a regenerator to produce a lean solvent for the absorber, and wherein the at least one of the flash vessel further produces an atmospheric flash gas.

13. The gas treatment plant of claim 12, wherein the absorber produces a sweet gas, wherein the regenerator is a vacuum stripper, and wherein at least a portion of the sweet gas and at least a portion of the atmospheric flash gas are separately fed into the regenerator as a stripping gas.

14. The gas treatment plant of claim 13 wherein the regenerator is configured such that carbon dioxide in the atmospheric flash gas strips hydrogen sulfide from the flashed rich solvent, and that the at least portion of the sweet gas strips the carbon dioxide from the flashed rich solvent.

15. A gas treatment plant comprising:

a flash vessel that produces an atmospheric flash gas comprising a first acid gas and a flashed rich solvent comprising a second acid gas;

a vacuum stripper fluidly coupled to the flash vessel and producing a lean solvent from the flashed rich solvent; and

wherein the atmospheric flash gas and a sweet gas are fed into the vacuum stripper at a position such that (a) the first acid gas strips the second acid gas from the flashed rich solvent and (b) the sweet gas strips the first acid gas from the rich solvent.

16. The gas treatment plant of claim 15 wherein the first acid gas is carbon dioxide, and wherein the second acid gas is hydrogen sulfide.

17. The gas treatment plant of claim 15 wherein the flash vessel receives a rich solvent from an absorber, wherein the rich solvent is contacted with a recycling gas before the rich solvent enters the flash vessel.

18. The gas treatment plant of claim 17 wherein the recycling gas is produced in another flash vessel that is upstream fluidly coupled of flash vessel and downstream fluidly coupled to the absorber.

19. The gas treatment plant of claim 17, further comprising a contact vessel in which the rich solvent contacts the recycling gas.

20. The gas treatment plant of claim 17 wherein the absorber receives a feed gas at a pressure of at least 2000 psig, and wherein the feed gas comprises a natural gas.

AMENDED CLAIMS

received by the International Bureau on 26 February 2004 (26.02.2004)
original claims 1-20 replaced by new claims 1-20 (3 pages)]

What is claimed is:

1. A gas treatment plant comprising an absorber in which acid gas is removed from a feed gas using a physical solvent to thereby produce a rich solvent, wherein the rich solvent is contacted with a recycle gas at a location downstream of an equilibrium stage where the feed gas enters the absorber, and wherein the recycle gas is produced from the rich solvent.

2. The gas treatment plant of claim 1 wherein the feed gas comprises natural gas at a pressure of at least 2000 psig, and wherein the acid gas is at least one of hydrogen sulfide and carbon dioxide.

3. The gas treatment plant of claim 1 wherein the recycle gas is produced from flashed gases of a plurality of serially coupled flash vessels, and wherein the recycle gas is compressed to absorber pressure.

4. The gas treatment plant of claim 1 wherein the rich solvent is flashed in a flash vessel to produce an atmospheric flashed rich solvent that is fed into a vacuum stripper to produce lean solvent.

5. The gas treatment plant of claim 4 wherein the vacuum stripper separately receives as a stripping gas a sweet gas produced by the absorber and atmospheric flash gas from the flash vessel.

6. The gas treatment plant of claim 1 wherein the rich solvent is contacted with the recycle gas in the bottom portion of the absorber.

7. The gas treatment plant of claim 1 wherein the rich solvent is contacted with the recycle gas in a static mixer outside the absorber.

8. A gas treatment plant comprising a contact vessel in which a rich solvent that is formed in an absorber contacts a recycle gas, wherein the recycle gas is produced from the rich solvent, and wherein the absorber receives a feed gas from which an acid gas is removed using a physical solvent, thereby producing the rich solvent.

9. The gas treatment plant of claim 8 wherein the feed gas comprises natural gas at a pressure of at least 2000 psig, and wherein the acid gas is at least one of hydrogen sulfide and carbon dioxide.

10. The gas treatment plant of claim 8 wherein the contact vessel comprises a static mixer, and wherein the contact vessel is fluidly coupled to a flash vessel.

11. The gas treatment plant of claim 8 wherein the rich solvent is flashed downstream of the contact vessel in a plurality of sequentially coupled flash vessels, wherein each of the flash vessels produces a portion of the recycle gas.

12. The gas treatment plant of claim 11 wherein at least one of the flash vessels produces a flashed rich solvent that is fed into a regenerator to produce a lean solvent for the absorber, and wherein the at least one of the flash vessel further produces an atmospheric flash gas.

13. The gas treatment plant of claim 12, wherein the absorber produces a sweet gas, wherein the regenerator is a vacuum stripper, and wherein at least a portion of the sweet gas and at least a portion of the atmospheric flash gas are separately fed into the regenerator as a stripping gas.

14. The gas treatment plant of claim 13 wherein the regenerator is configured such that carbon dioxide in the atmospheric flash gas strips hydrogen sulfide from the flashed rich solvent, and that the at least portion of the sweet gas strips the carbon dioxide from the flashed rich solvent.

15. A gas treatment plant comprising:

a flash vessel that produces an atmospheric flash gas comprising a first acid gas and a flashed rich solvent comprising a second acid gas;

a vacuum stripper fluidly coupled to the flash vessel and producing a lean solvent from the flashed rich solvent; and

wherein the atmospheric flash gas and a sweet gas are fed into the vacuum stripper at a position such that (a) the first acid gas strips the second acid gas from the

flashed rich solvent and (b) the sweet gas strips the first acid gas from the rich solvent.

16. The gas treatment plant of claim 15 wherein the first acid gas is carbon dioxide, and wherein the second acid gas is hydrogen sulfide.

17. The gas treatment plant of claim 15 wherein the flash vessel receives a rich solvent from an absorber, wherein the rich solvent is contacted with a recycling gas before the rich solvent enters the flash vessel.

18. The gas treatment plant of claim 17 wherein the recycling gas is produced in another flash vessel that is upstream fluidly coupled of flash vessel and downstream fluidly coupled to the absorber.

19. The gas treatment plant of claim 17, further comprising a contact vessel in which the rich solvent contacts the recycling gas.

20 The gas treatment plant of claim 17 wherein the absorber receives a feed gas at a pressure of at least 2000 psig, and wherein the feed gas comprises a natural gas.